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DELAWARE COLLEGE
AGRICULTURAL
Experiment Station.

BULLETIN No. XLII.
DECEMBER, 1898.

The European and Japanese Chestnuts in the Eastern United States.

By G. Harold Powell.

NEWARK, DELAWARE.

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Agricultural Experiment Station.

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THE EUROPEAN AND JAPANESE CHESTNUTS IN THE EASTERN UNITED STATES.

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Introduction. Commercial chestnut culture is beginning to take a place among the permanent horticultural industries of the United States. The enormous annual crops of small, sweet chestnuts, and the lack of appreciation of the value of the chestnut in the dietary economy by Americans have held back the systematic amelioration of the American type into large, desirable kinds, and discouraged, for many years, the introduction of improved varieties from Europe or Asia. A few European seedlings have been growing for nearly a century within fifty miles of Wilmington, Delaware, and Philadelphia, Pennsylvania, where the history of the European chestnut in America largely centers. In all this time, but few orchards or groves have been developed, and only within a few years have any of the seedlings been selected for commercial propagation.

History of the European Chestnut. The European chestnut, which is popularly called the "Spanish Chestnut," was introduced into the United States, not for economic purposes, but by individuals who wished to determine its adaptability to their private estates. Nearly all of the varieties now in propagation are descendants from the French "Marrons," and the appellation "Spanish" is an anomaly. New varieties are not being extensively introduced from Europe at present, but many persons have planted the nuts of the best naturalized kinds, like the Paragon, hoping to discover among the variable progeny, seedlings, that are superior to their parents.

The earliest history of the European chestnut, in America, is hidden in obscure book notices, or in the note books of those who were interested in early American agriculture.

The introductions that mark the beginning of the general dissemination around Wilmington and Philadelphia were those of Eleuthere

Irénée du Pont de Nemours, who, with his family, emigrated from France to America in 1799 and after a residence at Bergen Point, N. J., where he took much pleasure in propagating a number of European seeds and plants received from France, removed to Delaware in 1802 and settled on the Brandywine, where he established the famous du Pont Powder Mills.

Irénée du Pont, as he was usually called, had pronounced tastes for horticulture and agriculture, and in coming to America had credentials from the Institute of France, authorizing him to secure for the Institute useful information on the flora and sylva of the United States. Mr. du Pont forwarded boxes of seeds to France from time to time, and among them was a case to Madame Bonaparte, wife of the First Consul, afterwards the Empress Josephine; and in return many plants and seeds were sent to him. In the winter of 1802-3, he writes to Mr. Prudhomme, a Frenchman, who was a neighbor at Bergen Point, and an ardent horticulturist,—"I greatly regret that all the chestnuts which were sent from France were spoiled, but I hope that we will be luckier next season, and I have taken steps to procure not only French chestnuts, but young trees as well, from different sources." Although the date of the receipt of this shipment of chestnuts is not recorded, it can be inferred from Mr. du Pont's journals and correspondence, that he planted a number of French chestnuts in his garden at Eleutherean Mills, Christiana Hundred, near Wilmington, Delaware, in the spring of 1803, and it is certain that a considerable number of trees became established and flourished there, some of which are still in existence.

Irénée du Pont had large and varied business interests. He carried on an extensive correspondence and had a wide acquaintance around Wilmington and Philadelphia. To many of his friends he sent nuts or cions from his famous French Marrons, and from these chestnuts a multitude of seedlings sprang up and are still standing along the fence rows or in the gardens.*

A few of these surviving seedlings, by attracting the attention of enterprising nurserymen, have thereby entered the variety ranks, but there are numbers that have long lain in obscurity, which, if introduced, might justly claim varietal distinction. The history of the named varieties is much confused, for it is based, in many cases, on the uncertain memory of those who have been longest acquainted with the trees.

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* The notes on the du Pont introductions were sent me by Colonel Henry A. du Pont, President of the Wilmington & Northern Railroad Company, who gathered them, after much research, from the correspondence and other papers of his grandfather, Irénée du Pont. See Annual Report 1898-9 for notes on other early introductions.

History of the Japanese Chestnuts. The development of the Japanese chestnut in America is the outcome of the systematic efforts of a number of nurserymen to introduce varieties from Japan, or to produce valuable seedlings from those already naturalized. The history of the type is, therefore, much more accurate and satisfactory.

In 1876, the S. B. Parsons Co., Flushing, N. Y., imported a few trees from Japan through the late Thomas Hogg. (Fuller). The trees, Mr. S. B. Parsons writes, were cultivated with no special care, but the large nuts soon attracted attention. The *Parson's Japan* was well known a few years ago, but at present no important varieties are cultivated from this importation.

In 1882, the late William Parry, Parry, N. J., imported one thousand grafted trees from Japan, and from them a single tree, the *Parry*, was finally selected, and has since become the progenitor of more valuable kinds than any other Japanese chestnut. The Parry Bros., who succeeded William Parry, have selected a large number of seedlings of the *Parry* for commercial propagation.

Luther Burbank, Santa Rosa, California, planted a box of the largest Japanese chestnuts sent him from his collector in Japan in 1886, and from over ten thousand bearing seedlings, after years of critical study and elimination, recently selected three as worthy of perpetuation,—the Hale, the Coe, and the McFarland, now owned and propagated by J. H. Hale, South Glastonbury, Conn.

The Lovett Company, Little Silver, N. J., were active, at about the same time, in introducing the type through imported trees and nuts, and from the trees sent out by them, several meritorious kinds have been named by J. W. Kerr, Denton, Maryland, and J. W. Killen, Felton, Delaware.

A number of other firms have been introducing and distributing the nuts, but nearly all of the named varieties can be traced to the introductions of the firms mentioned.

The advent of the Japanese chestnut in the United States, and the recent publication of a bulletin on Nut Culture by the Division of Pomology at Washington, have greatly stimulated the interest in commercial chestnut growing, and have attracted the attention of prominent horticulturists to the possibilities of a desirable industry, thoroughly adapted to American conditions. The Albion Chestnut Company, at Clementon, New Jersey, has already grafted one hundred and fifty acres of stump land to the best varieties of European and Japanese nuts; the Mammoth Chestnut Company, of the same place, has nearly an equal acreage; at Riverton, N. J., the orchard form of chestnut culture is under trial by Joseph Williams, who has set seven thousand five hundred trees on valuable land; and at Emilie, Penn., Joseph T. Lovett has 1000 grafted Paragons, ten years old, set 33 feet apart each way, which he writes are a decided success. The trees produce from eight to twelve quarts of nuts per year, are very free from worms, and sell readily at four to eight dollars per bushel.

The varieties of Japanese chestnuts have been considerably confused through the unfortunate practice of some who have sent out seedlings under such names as "Japan Mammoth," "Japan Giant," and "Japan Sweet." These names, as generally used, have no varietal significance, for chestnut seedlings vary as widely as apple seedlings.

Geographical Adaptability. We can give no definite data that will establish the geographical limits of the cultivated chestnuts. Experimental effort is needed to establish their range of adaptability. It is not improbable that their distribution will follow the areas of the American chestnut, falling short of its extension in certain localities, and extending beyond it in others. As a guide to the possible geographical adaptability, the range of the American chestnut, adapted from Sudworth's "Check List of the Forest Trees of the United States," is given.

"From Southern Maine to Northwestern Vermont (Winooski River), Southern Ontario, and Southern Shores of Lake Ontario to Southeastern Michigan; southward to Delaware and southeastern Indiana, and on the Allegheny Mountains to Central Kentucky and Tennessee, Central Alabama, and Mississippi."

USES OF THE CHESTNUT.

Before chestnut culture can become a prominent industry, there will need to be a larger appreciation of the uses to which the chestnut can be put. Popular sentiment will also need revising, so that the chestnut harvest will not be looked upon as public property, purposely grown for the benefit of the community at large. The chestnut industry, as a means of enlarging the food supply of the United States, is a horticultural phase that is worthy of serious consideration. In many European countries the chestnut is looked upon as a staple article of diet.

In France. Griffin* says, that in France, "from the Bay of Biscay to Switzerland, there are large plantations, and almost forests, of chestnut trees." The nuts "are broad, large, and resemble the American horse-chestnut or buckeye (*Esculus hippocástanum*), and are extensively eaten by human beings and animals." * * * "The poor people, during the fall and winter, often make two meals daily from chestnuts. The ordinary way of cooking them is to remove the outside shell, blanch them, then a wet cloth is placed in an earthen pot, which is almost filled with raw chestnuts; they are covered with a second wet cloth and put on the fire to steam; they are eaten with salt or milk. Hot steamed chestnuts are carried around the city streets in baskets or pails; the majority of the working people, who usually have no fire in the morning, eat them for their first breakfast, with or without milk." * * * "These nuts are often used as a vegetable, and are exceedingly popular, being found on the table of the well-to-do and wealthy. They are served not only boiled, but roasted, steamed, puréed, and as dressings for poultry and meats."

"Chestnuts are made into bread by the mountain peasantry. After the nuts have been blanched, they are dried and ground. From this flour, a sweet, heavy, flat cake is made. It resembles the oaten cakes so popular among the peasants."

In Italy. In Italy, Bruhl† says that the chestnut forms a considerable part of the diet of the people during the fall and winter, where they are generally eaten roasted. "They are also much eaten in a cooked state; often prepared like a stew, with gravy." He says, also, "the chestnuts are dried until they are as hard as dried peas, then shelled, after horses have been driven over them to crack the shells." The dried nuts can be shipped anywhere "and are said to be as good for cooking purposes as the fresh ones. These are also sold on the streets and eaten like peanuts."

In Korea. In Korea, Allen says, "By far the most common food nut is the chestnut, which almost takes the place with the Korean which the potato occupies with us. The chestnut is used raw, boiled, roasted, cooked with meat, made into confections, powdered and mixed with

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*U. S. *Commercial Agent*, Limoges, France, in "Advance Sheets of Consular Reports," On Nuts as Food in Foreign Countries, Oct. 17, 1898. No. 249, Washington, D. C.

† U. S. Consul, Catania, Italy, l. c., p. 5.

candy, and dried whole, in which latter condition it becomes quite sweet, but is apt to be affected by worms."*

In Japan. According to Rein† great quantities of chestnuts are raised in Japan, but there they are used less for human food than they are elsewhere. They are fed largely to swine. The latter practice may account for the poorer quality of the Japanese chestnut; quantity, rather than quality, being the desideratum among the Japanese. Sargent,‡ on the other hand, in referring to the human use of the chestnut in Japan, disagrees with Rein, and says, "I have never seen chestnuts offered in such quantities in any American or European city as in those of Tokyo, and other Japanese towns."

The composition of the European chestnuts has been shown by Frear§ to be similar to that of wheat. By the same writer and by others it is stated that the chestnut is easily digested after the starch grains have been burst open and made less resistant to the attacks of the digestive fluids, by cooking.

BOTANICAL CONSIDERATIONS.

The botanical rank of the chestnut groups is much perplexed. Botanists are unanimous in according the European chestnut specific rank, but the Japanese and the American types are considered both as varieties and as species by various authors. Personally, I prefer to consider the three groups as distinct species, for as they are growing in America, each has broadly differentiated characters on which to base specific rank.

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[*] U. S. Consul General, Seoul, Korea, l. c., p. 10.

[†] The Industries of Japan, J. J. Rein, p. 93.

[‡] Forest Flora of Japan, 1894.

[§] Pennsylvania State College Agr. Exp. Sta. Bul. No. 16, Analysis of Several Varieties of Chestnuts.

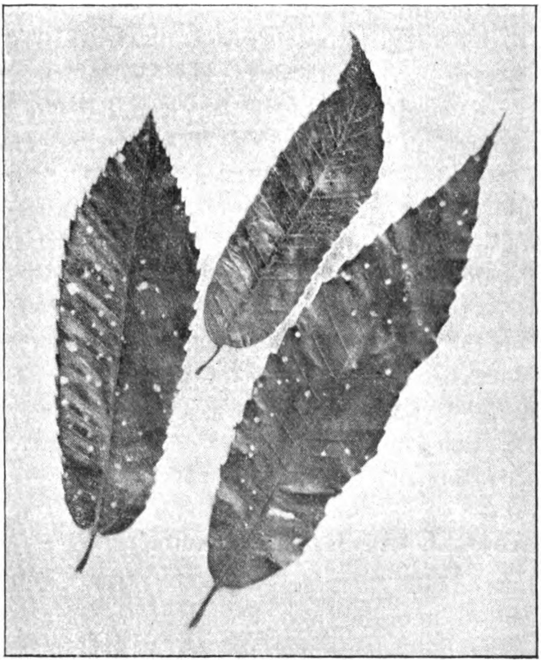

FIGURE I. *Types of Chestnut Foliage.* (1) *European at left.* (2) *Japanese in centre.* (3) *American at right. Note relative form, serrations, freedom of the Japanese only, from leaf-blight.*

European Group. The European chestnut is a large, close-headed, but broadly spreading tree, with thick branches and large buds; oblong-lanceolate and generally abruptly-pointed, thick, leathery leaves, bearing small, sometimes incurved teeth, and generally pubescent beneath when young, and smooth and green on both sides when mature. The burs are enormously large, with a thick, felt-like, hairy lining; the nuts are thickly pubescent at the tip, and sometimes over considerable of the sides; variable in quality from bitter to sweet; with a long point. The trees retain the foliage late in the fall, and it is susceptible to the attacks of leaf fungi. (See Figs. 1, 3, 4, 5, 8.)

American Group. The American chestnut differs in a larger, freer, more upright form; more slender branches; larger, thinner, more pointed leaves, with larger, more spreading teeth, in a greater pubescence when young; smaller burs, and sweeter, smaller, more pubescent nuts. The foliage is also susceptible to leaf fungi, and is shed earlier in the fall. (See Figs. 1, 2.)

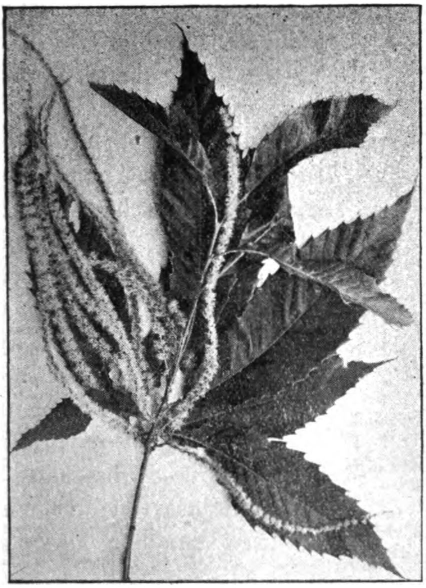

FIGURE 2. *Staminate Catkins. American.*

Japanese Group. The Japanese chestnut is a semi-dwarf, close-headed tree, with very slender, slow-growing wood, bearing small buds close together, and apparently, though not actually, opposite, on the smaller growth. The leaves are smaller than the American or European, quite like the peach-leaf in appearance, long, narrow, generally pointed, with narrow, truncate or cordate base, white tomentose beneath and pale or bright green above, teeth, small and sharply awn-pointed. The burs are comparatively small, with a thin, often parchment-like, hairy lining. The nuts large, comparatively free from pubescence, earlier to ripen, and poorer in quality, though excellent when cooked. The foliage of the Japanese is apparently free from the attacks of the common leaf-fungi. The tree is a beautiful specimen for ornamental purposes. (See Figs. 1, 9, 10, 11, 12.)

The Blossoms. The chestnut is monecious, that is, the male and female flowers are separate on the same tree. Young, vigorous-growing trees frequently produce male flowers only, and after their excessive vegetative vigor ceases and the trees become older, the female flowers develop. The staminate flowers are borne in long, slender catkins, and are much more numerous than the pistillate flowers. (See Fig. 2). The pistillate flowers are clustered at the base of a long catkin, on the distal end of which the staminate flowers open later in the season, the catkin aborting down to the little female blossoms. (See Fig. 3.)

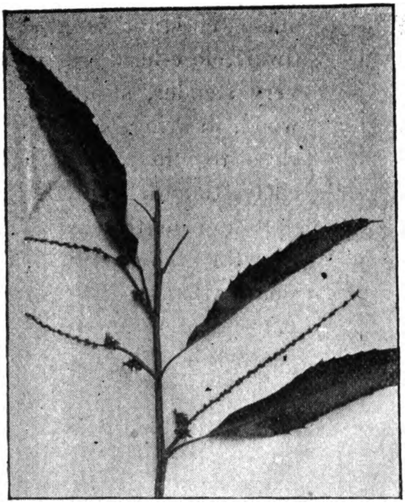

FIGURE 3. *Pistillate Flowers. European. Note the unopened staminate flowers beyond the former on the same catkin.*

The pistillate flowers are probably fertilized by both sets of staminate blossoms, the early ones fertilizing the early opening blossoms, and the later ones furnishing the pollen for those that are retarded. Thomas Meehan tells me that he thinks the pollen from the late staminate blossoms performs the function of fertilization, and that the great show of staminate catkins is a waste of energy, in the American chestnut. In both European and Japanese varieties, I have noticed that most of the pistils are receptive while the early staminate flowers are in bloom.

Synonomy of Species. The synonomy of the three species, largely adapted from Sargent's Sylva of North America, and Sudworth's Nomenclature of the Arborescent Flora of the United States, is given below.

European Chestnut. Castanea Castanea (L.) Sudworth.

Fagus Castanea Linn. spec. 997, 1753.
Castanea sativa Miller, Dict. ed. 8, No. 1, 1768.
Castanea vulgaris Lamark, Dict. 1, 708, 1783.
Castanea vesca Gaert, Fruct. 1,181 t. 37, 1788.
Castanea Castanea (L.) Sudworth, Arb. Fl. Washington, D. C., 7, 1891.

Japanese Chestnut. Castanea Japonica Blume.

Fagus Castanea Thunberg, Fl. Jap. 195, 1784.
Castanea vesca Blume, Bijdr. Fl. Ned. Ind. 524,1825.
Castanea vesca var. pubinervis Hasskarl, Cat. Alt. Hort. Bog. 73. (Nomen Nudum) 1844.
Castanea crenata Sieb. and Zucc., Abhand. Akad. München, IV, pt. iii. 224, 1846.
Castanea stricta, l. c. 225, 1846.
Castanea Japonica Blume, Mus. Bot. Lugd. Bot. 1,284, 1850.
Castanea vulgaris ε. *Japonica* A. de Candolle, Prodr. XVI, pt. ii, 115, 1864.
Castanea castanea var. pubinervis Sarg., Silva of N. A., IX, 9, 1896.

American Chestnut. Castanea dentata (Marsh.) Borkh.

Fagus castanea Wang., Beschreib. Nordam, Holz. 90, 1781.
Fagus Castanea dentata Marsh, Arb. Am. 46, 1785.
Castanea dentata Borkh., Handb. Forstb. 1, 741, 1800.
Castanea vesca var. Americana Michx, Fl. Bor, Am. 2, 193, 1803.
Castanea vesca Willd. Sp. Pl. IV, pt. 1, 460. (1805), in part.
Castanea Americana Raf., New Fl. iii, 82, 1836.
Castanea Americana var. Angustifolia Raf., l. c., 1836.
Castanea Americana var. latifolia Raf., l. c. 1836.
Castanea vulgaris γ Americana A. de Cand., Prodr. XVI, pt. ii, 114, 1864.
Castanea sativa var. Americana Sargent, Gard. and For., ii, 484, 1889.
Castanea Castanea (*L.*) *var. Americana* (Michx. f.) Sudworth, Arb. Fl. Washington, D. C., 7, 1891.
Castanea sativa, Jackson, Ind., Kew, i, 455, 1893.

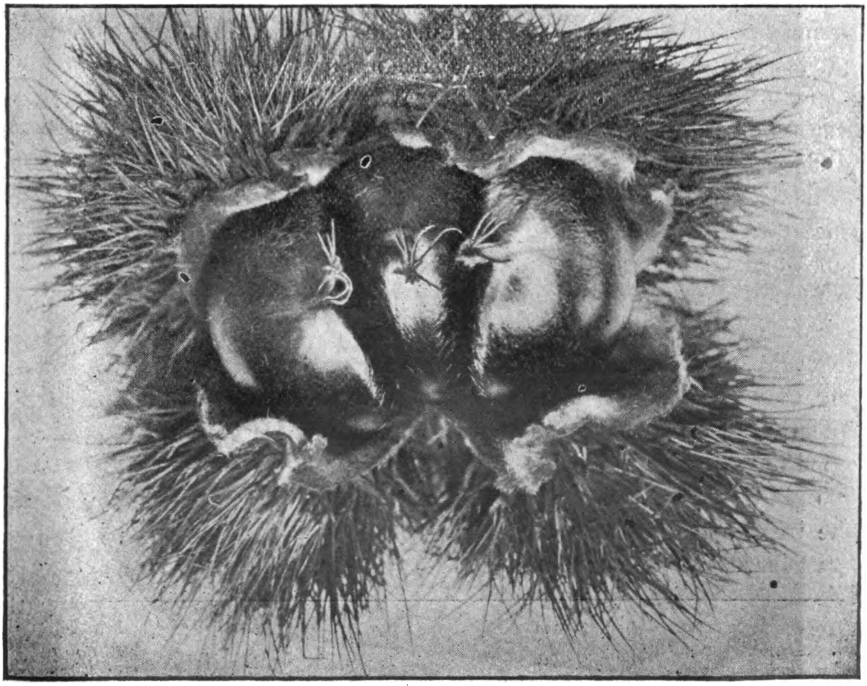

FIGURE 4. *Ridgely.* (*Natural size*). Page 26.

SUGGESTIVE HINTS ON CHESTNUT CULTURE.

The Production of Varieties. **Seedlings. The large varieties of cultivated, foreign chestnuts have been evolved from the wild types through centuries of selecting slightly better seedlings in each successive generation. Chestnut seedlings exhibit variations from the smallest American nuts to the largest Japanese, from enormous productiveness to approximate sterility, from an acorn-like flavor to a sweet, desirable quality, from ripening in August to maturity in October. Some of the seedlings hold their dead leaves all winter, others have nuts enclosed in a bur from which it is difficult to extract them. Certain varieties, like the *Parry*, are extremely prepotent, and their progeny exhibit striking similarities. From the desirable variations new kinds can be produced.**

Crosses. New kinds may be produced by crossing the varieties within the species, or the Japanese, European, and American varieties may be intercrossed. Mr. Luther Burbank informs me that he has a few hundred hybrid chestnuts just beginning to bear,—crosses of Japanese, European, Chinese, chinquapin, and others, among which are a number of extremely valuable varieties. Mr. Burbank thinks that *all* the chestnuts intercross as readily as the various varieties of apples.*

Bud Varieties. New varieties may possibly be developed from bud variations, as trees under apparently similar conditions, show the widest differences in bearing tendencies. The variations might be perpetuated in newly grafted trees, though it is quite possible that the violent differences within the cultivated varieties are due to the reciprocal action of stock and cion, when the union is imperfect. At any rate, in the perpetuation of a variety, too much care cannot be used in selecting cions for propagation only from trees with desirable bearing tendencies.

Propagation. Grafting. Chestnuts are propagated usually by grafting, though budding, with buds that have been held dormant, is frequently practiced in the spring in the South. The cions are inserted upon the stocks by different propagators in four positions, *i. e.*, in the root, in the crown, in the body or stem, and in the top or branches of the tree. Two methods of grafting are generally employed, the cleft-graft for stocks of large size, and the whip-graft for smaller stocks. A third system, the bark-graft, is occasionally used for very large stocks. The grafting technique must be performed most skillfully to insure a successful outcome. The cions should be cut with precision, and the young, fine wood, especially in the Japanese varieties, should be discarded. Immediately after inserting the cions, the stubs must be carefully covered with wax, or with waxed cloth, the latter method being preferable for young trees, as the stubs often do not close tightly. If the stub can be cut two or three inches above a fork, the openings close more firmly. In the Parry Bros. nurseries, the cions are cut from March first to April first, and inserted from April 15th to May 10th.

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*The writer projected an experiment in 1898, in the nurseries of Parry Bros., Parry, N. J., to determine the limits of crossing between the species, and the self-fertility or sterility of a number of varieties. Elaborate preparations were made for the experiment, but hordes of rose-bugs and blister-beetles devoured the pollen, and caused the experiment to be abandoned. Enough pollen escaped for natural pollenation.

Britton, of the Connecticut Station, in 1898, found from grafting over two hundred cions of the Japanese and European varieties on American stocks, that more cions live when inserted after the leaves had begun to expand.

The following figures have been furnished by Professor Britton:

Date of grafting.	Number living Oct. 1.
Before May 1,	10 per cent.
May 1 to May 15,	46 "
May 15 to June 1,	32 "
June 1 to June 15,	47 "
After June 15,	17 "

Britton says that the early grafts that survived made a much larger growth than the later ones. He states also that the cions take more readily in young shoots.

Stocks for Grafting in the Nursery. The cultivated varieties of the European chestnut are generally propagated, either upon their own American-grown seedlings, or upon native, American seedlings. Japanese varieties are often propagated upon seedlings grown from imported Japanese seed. Occasionally, seedling trees of the European chestnut are imported, but they are worthless for propagating purposes as the bodies become afflicted with Sun Scald. (See Fig. 7.)

Each species seems to work best upon stocks of the same type, but there is a close affinity between the Japanese and the American stocks, and between some varieties of the Europeans and the American seedlings. The Japanese worked upon the American makes a perfect union and a vigorous growing tree, but J. W. Kerr, of Denton, Md., S. C. Moon, of Morrisville, Pa., and a few others use the American-grown, Japanese-seedling stocks in preference, claiming a closer affinity for stock and cion.

The European varieties are propagated largely upon American stocks, and successfully with many varieties, but nurseryman are coming to use seedlings of the European varieties in preference. The European cions sometimes outgrow the American stubs, making an enlarged, or a poorly united union, the cion frequently blowing out during the first season of growth.

The particular form of grafting used in the nursery is a personal and local question. J. W. Kerr propagates the Japanese nuts by root-grafting on one year old roots, because, he says, he escapes all loss from body scald by this method. J. H. Hale uses the crown-graft system, inserting the cions just below the surface of the ground, and obtains

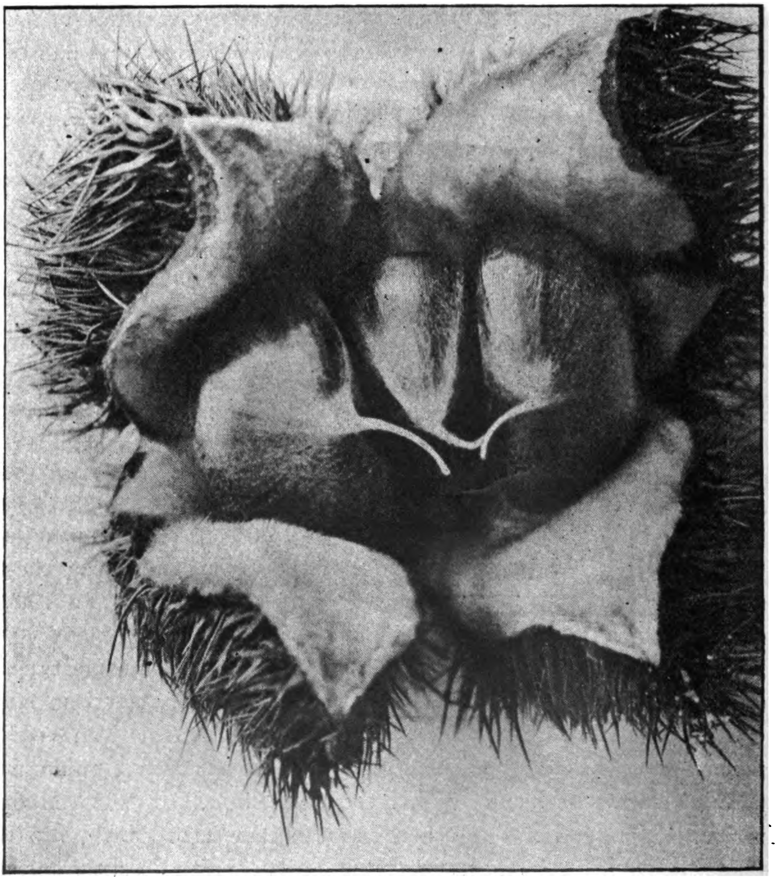


FIGURE 5. *Numbo. (Natural size). Page 26. Note the long tips to nuts, and long bur.*

excellent results in grafting the Japanese nut upon its own stock in this manner, and P. Emerson has adopted the same plan. S. C. Moon uses the stem or top-graft on two or three year old stocks, claiming that "the roots, in root-grafting, are too slow in re-establishing in the soil, and the grafts frequently die before the roots can support them."

American seedling stocks, two or three years old, can be bought at $8 to $10 per thousand. Cions for grafting are sold by the foot. European wood will cut two cions of two buds each per foot, and the Japanese from four to six cions of two buds each per foot. Two buds in the European, and three or four in the Japanese, are left on the cions in grafting.

The Chestnut Orchard. The chestnut orchard should be located on a well drained, porous soil, with a deep, porous subsoil, through which the roots can descend and supply the tree with moisture in drying weather. It is more important to have thorougly drained soil than soil of a particular character, and the trees will then flourish on light sands or heavy clays. Limestone lands are generally uncongenial to the chestnut, due probably to the close proximity of the underlying rocks to the surface, for in limestone soils with well-dained, deep, porous subsoils, the chestnut thrives heartily.

Trees already grafted with the desired varieties may be obtained for the orchard, or seedling trees can be bought and top-worked with the permanent kinds after they have become thoroughly established. The advantages of top-working in the latter manner were fully set forth in Bulletin No. XXXVIII, on "Some Underlying Principles in Delaware Apple Culture," and the benefits enumerated there will have equal value in chestnut growing.

An extensive experiment is in progress at Riverton, N. J., on the farm of Mr. Joseph Williams, where 7,500 American seedling trees, from four to six feet high, were set twenty feet apart each way in the winter of 1896-7 and in the spring of 1898. In the spring of 1898, the trees first set were whip-grafted on their branches with European and Japanese varieties. A leading shoot was cut back to two-year-old wood, because one-year-old was not large enough, and a cion inserted in it. The operation was then repeated in one or two of the side shoots. About fifty per cent. of the cions lived, the loss being attributed to imperfect waxing, and to the use of two fine wood in the Japanese varieties. Mr. Williams now feels that the trees should stand at least two seasons before they are grafted, so that they can become more thoroughly established, and the branches attain a larger size for grafting.

Where the stocks are vigorous and large, the cions frequently make a growth of three or four feet the first year, and then there is danger of a top-heavy tree. Where the growth is too rapid, the vigor can be checked by pinching the tips of the growing cions to induce the formation of side branches.

The European chestnut should be set not less than forty feet, and the Japanese not less than thirty feet apart each way. The trees can be planted much closer at first and cut out to those permanent distances ten or fifteen years later after several profitable crops have been removed. The care of the young orchard should be the same as that given a young apple plantation.

The Chestnut Grove. Commercial chestnut growing is confined largely to native groves, grafted with European or with Japanese varieties. The American trees are usually cut down, and the sprouts, springing from the remaining roots, are grafted with the desired varieties, after a diameter of a half or three-quarters of an inch has been attained. The grafting is done by the whip, or by the cleft methods. The precautions already mentioned under propagation, apply with equal force in grafting in the chestnut grove. The Japanese varieties form perfect unions with the sprouts, but the European kinds frequently out-grow the stubs, and cause an enlarged, or an imperfect union.

Subsequent Care of the Trees. Grafted chestnut trees are precocious. The grafts of the Japanese sorts on sprout land frequently set fruit the same year of insertion, and their early bearing tendencies often prevent a satisfactory development of the tree. Two year old grafts are commonly loaded with burs in both Japanese and European kinds, though the Japanese varieties as a class bear earlier, both when grafted and from seed. It would probably be a profitable undertaking to keep the burs picked from the young trees for three or four years, in order that they might become strong and thoroughly established before the strain of reproduction is upon them. The young trees should also be pruned to an open spreading form, with three to five main branches on which the top will eventually form, after which the trees themselves will need little care other than good culture. If the trees are allowed to over-bear, the nuts run down in size.

Do Varieties Need Cross Fertilizing? The question cannot be answered satisfactorily with our present knowledge. Nearly all of the European varieties abort a large proportion of their burs when the latter are partly grown, the Paragon and Comfort being freer from it than any of the other kinds. I have seen instances of European trees that are non-productive at ten years old when standing alone, but whether they would be more productive in proximity to other varieties is an open question. The Japanese varieties do not abort their burs, and seem to be completely self-fertile. In the absence of definite information, we would advise mixed planting as a safeguard.

The blooming period of a number of varieties in different localties is given below, the records being taken by Mr. J. W. Kerr, Denton, Md., 1897, and by Mr. J. W. Killen, Felton, Del., in 1897, and by Mr. Frank Bartram, with Parry Bros., Parry, N. J., in 1898. Mr. Bartram informs me that the records taken by him are not satisfactory, as the rose-bugs destroyed the pollen before the trees were out of bloom, making the termination of bloom uncertain. The records, however, are given, as showing the time when the blossoms first appear. The pistillate blossoms are generally visible before the staminate unfold. The records of Mr. Killen show the time of full bloom only.

VARIETY.	OBSERVERS.		
	J. W. KERR. 1897.	FRANK BARTRAM. 1898.	J. W. KILLEN. 1897.
Advance. J		June 20 to June 30	
Beta. J.		June 22 to July 2	
Biddle. J.	June 9 to June 30		
Black. J.	June 5 to June 24		
Comfort. E.		June 30 to July 9	
Eureka. J.		June 17 to June 27	
Felton. J.		June 25 to July 1	June 19-25 Full Bloom.
Kent. J.		June 17 to July 1	June 19-25 Full Bloom.
Kerr. J.	June 3 to June 25		
Killen. J.			June 19-25 Full Bloom.
Martin. J.	June 16 to July 1		
Numbo. E.	June 15 to July 2	June 18 to June 30	
Paragon. E.	June 15 to July 1	June 30 to July 9	June 23 Full Bloom.
Parry. J.		June 20 to June 30	
Prolific. J.		June 17 to June 27	
Reliance. J		June 18 to July 6	
Ridgely. E.	June 15 to July 2	June 17 to July 2	June 23 Full Bloom,
Success. J.		June 20 to July 7	
Superb. J.		June 23 to July 7	

Prices of Nuts. In 1896, Alpha and Early Reliance sold in September for $14 per bushel; Parry, ripening a little later, at $12; Numbo at $10, and Paragon, still later, at $7 and $8. In 1897, the prices were a little lower, and the scale descended as the season progressed. In 1898, Alpha began selling at $12, but owing to the unusually heavy crop of native nuts from Virginia at that time, and the enormous crop later on throughout the country, the price soon fell, and the cultivated varieties sold from $4 to $7 per bushel throughout the season.

The earliest and the biggest chestnut commands the highest price. Earliness is the more important factor. Quality, at present, is not considered by the purchaser, the crop selling largely from the street stands to boys and girls. The nuts should be carefully graded into two or three sizes before shipping and the wormy ones destroyed, as the price of a mixed lot is regulated by the smallest nuts. The chestnuts are shipped in bags, or in crates holding a number of small baskets. The burs and nuts are gathered every few days, and the burs that do not cast their nuts are torn open by an operator wearing leather mittens.

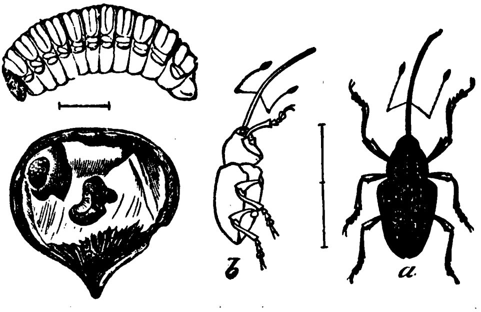


FIGURE 6. *Chestnut Weevil.*

Insect Pests. The chestnut is attacked by a number of insect pests, the most serious of which are the weevils, which, in their larval form, are the grubs ordinarily found in the nuts. The grubs are footless and of two sizes, the larger one is the larva of *Balaninus caryatrypes*, and the smaller one one of *Balaninus rectus.* The latter species is shown in Fig. 6, loaned by Doctor J. B. Smith, of the New Jersey Station. The adult beetles appear when the chestnuts come into bloom, and the egg-laying begins shortly after the staminate catkins drop and continues into August. The beetles have long, slender snouts, with which they bore through the young burs, into the nut itself. An egg is placed into the cavity by the female, and the minute hole in the shell heals completely over. Several eggs may be deposited in a single nut, the female regulating the number by the size that the nut will eventually attain. The larvae hatch and work within the nut, and mature about the time of, or a little after, the ripening of the chestnuts, even though the varieties ripen a month or more apart. The fully grown grub eats a hole through the shell, escapes to the ground, where it changes into a pupa, and appears in beetle form at the next blooming season.

The chestnut weevils frequently levy tribute on three-fourths or more of the crop. The European species suffers more than the Japanese, and certain varieties are more seriously attacked than others. Chestnut groves on sprout land, or in close proximity to chestnut forests, suffer most seriously, and the advisability of grafting sprout land with the improved varieties is being gravely considered by commercial growers on account of the annual loss from the wormy nuts.

The control of the chestnut weevil is taxing the ingenuity of growers and entomologists, and no entirely satisfactory methods can be recommended at the present time. The principal means of lessening the evil lies in locating the chestnut orchard away from a native forest, for immunity from the weevil cannot be expected where the grafted trees are surrounded by native woods. A second means of reducing the number of beetles for a given year is to destroy all of the larvæ in the nuts of the preceding season. This can be done by scalding the nuts for a few minutes in water; by destroying the nuts that rise to the top of the water when a lot are submerged; by keeping the nuts for a few days in tight boxes and killing the grubs as they come out with bi-sulphide of carbon; by gathering all nuts from the ground and destroying the wormy ones in any of the ways mentioned above. The treatments just enumerated are the ones generally recommended, and, in orchard culture, would probably help reduce the beetles, but, in the wild chestnut grove, the few worms that would be destroyed form a small proportion of the total number that escape, and their value there is seriously doubted. Jarring the beetles into sheets, as the plum-growers do the curculio, might also be practicable with the smaller trees, and is worthy a commercial trial; and varieties that are particularly agreeable to the weevil, like Cooper, might be scattered through an orchard to attract the beetles from other trees. All of the burs from these trees should be finally destroyed.

To sum up the means of reducing the injury from the weevil, the following suggestions are offered:

Plant orchards away from native chestnut forests, or if the latter are small, graft them entirely over.

Destroy all wormy nuts and all the worms that escape.

Plant varieties least desired by the weevil.

Plant a few trees throughout the orchard to attract the weevil, and destroy all burs that form on them.

Catch the beetle as the plum curculio is caught. See Bulletin No. XXXV for method.

Fungous Troubles. One of the distinct differences between the Japanese and the European chestnut is the susceptibility of the latter to leaf fungi, and the practical immunity of the former. Several fungi attack the leaves of the European and the American chestnuts. Those causing the serious injury are Marsonia ochroleuca and Cryptosporium epiphyllum.

In 1897, the European varieties in the Albion Chestnut Company's grove, comprising Paragon, Corson, Comfort, Numbo, Scott, Cooper, and Styer, were a total failure, excepting Paragon, on account of the attacks of the leaf fungi. The leaves become covered with small, brown spots, and the foliage assumes a sickly, brownish appearance in September, if the attack is severe. In Fig. 1 is shown the character of the trouble on both European and American leaves. In 1898, the disease was again severe on the Europeans, but less so than in 1897, and the adjoining Japanese varieties were entirely free from it. Ridgely, Styer, and Bartram were freest from the trouble in 1898, while Paragon, Comfort, Corson, Cooper, Scott, and Styer were about equally affected.

Experiment to Control Leaf Blight. Nine trees in a Numbo orchard, about twenty to thirty feet high, were sprayed with Bordeaux mixture under the direction of Mr. John R. Parry, in 1898. The spraying was done May 18, May 24, June 18, and August 20, and the Bordeaux mixture was apparent till the foliage dropped in the fall. The foliage of the sprayed trees was free from the leaf fungi, and was bright, dark-green in color throughout the season. The foliage on all adjoining trees was slightly affected with the fungi. The results show the value of Bordeaux mixture in controlling the disease. The actual labor is no more than that used in spraying apple trees.

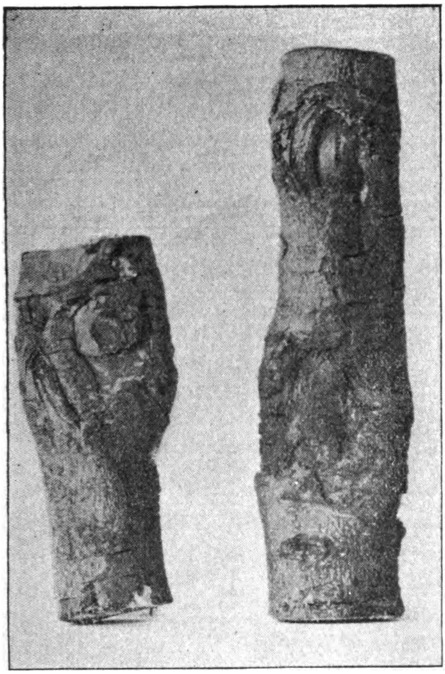


FIGURE 7. *Sun Scald or Body Blight.*

Body Blight. The trunks of the chestnut trees in the nursery frequently blight upon the south and west sides. The bark splits or sinks in and the affected tree finally dies. Larger Japanese seedling trees, eight to ten years old, are sometimes affected in the same manner, but I have not observed the difficulty on the larger Europeans. Imported European seedling trees seem to be more susceptible than any others, and American seedling stocks are affected to a lesser extent. Fig. 7 shows sections of the trunk affected with the body blight. The sections were taken from trees in a lot of one thousand imported European seedlings, nine hundred and fifty of which died soon after setting out. As the malady nearly always appears on the south and west sides of the tree, it is thought that the trouble is not unlike the *Sun Scald* of cherry and other young fruit trees. The nature of *Sun Scald* is fully set forth in Bulletin No. XXXV on "The Cherry in Delaware."

European or Japanese Varieties. One of the first considerations to confront the prospective commercial chestnut grower is, "Shall the European or the Japanese varieties be planted, or both?" The question is a difficult one to discuss without awakening enmity, for both species have equally earnest advocates. The writer, however, will attempt to place their merits side by side as impartially as possible, basing the estimate not on a limited observation of a few trees, but on an acquaintance with both species growing together on a large commercial scale.

JAPANESE GROUP.

Advantages.

1. Early maturity of tree.
2. Ease of caring for trees.
3. Early ripening of nuts.
4. Large size of nuts.
5. Enormous productiveness.
6. Small size of bur.
7. Freedom from Leaf-Blight.
8. Freer from worms than Europeans.
9. The money makers in the large groves.
10. Affinity for American stocks.
11. Ornamental value.

Disadvantages.

1. Overbearing, if not thinned.
2. Poorer quality of many.
3. Delicate growth of some.

EUROPEAN GROUP.

Advantages.

1. Great productiveness of some.
2. Timber value of tree.
3. Finer quality.
4. Beautiful appearance of nuts of some.
5. Prolific bearing of a few.

Disadvantages.

1. Late maturity of many.
2. Late ripening of nuts.
3. Shy bearing of many when young.
4. Largeness of bur, which may become water-soaked and break the trees.
5. Great susceptibility to leaf blight.
6. Greater susceptibility to weevil.
7. Do not compare with Japanese in the commercial groves as money makers.

It can be stated as a general principle, that the Japanese Flora is better fitted to the climatic conditions of the Eastern United States than the flora of Western Europe, the latter succeeding best on the Pacific Coast. Hence it is thought that if the Japanese species is used as a basis for further improvement, happier results will eventually follow its amelioration in the Eastern United States. The Japanese or European varieties, as they exist, should be looked upon only as stepping-stones to better kinds. By the continued judicious selection of seedlings from varieties of the best flavor, the quality of the Japanese chestnut can be greatly improved in a few generations. Some of the finer quality of the chinquapin or of the native chestnut might be infused into the Japanese with happy results, and a more vigorous tree would follow the incorporation of a little European blood. One type should supplement the other wherever the adaptibility of both is proven.

MONOGRAPH OF VARIETIES.

The nomenclature of the chestnut varieties is greatly confused. The varietal characters are often not strongly marked, and many of the varieties have never been fully described. In fact it is difficult to record the differences so that the variety can be determined from the description. The European kinds are not the survivors of a rigid elimination in which only strongly marked types have persisted, but rather the accumulation of a number of seedlings in which largeness has been the factor in determining their survival. Among the Japanese varieties the confusion has resulted from the practice of distributing seedlings under such names as Giant, Mammoth, and Japan.

The varieties have been described in nearly all cases from a large number of specimens, and an acquaintance with the trees. Various measurements are recorded in order to give an idea of the form of the nut. The measurements, however, should not be looked upon as absolute, for the actual size, and the form itself, will vary in different localities, and with the age of the tree. In a few cases the writer quotes the descriptions of the late Andrew J. Fuller, whose accuracy and fullness are often models of variety description.

The monograph is incomplete in many respects, but it was thought that it would form a satisfactory basis for further revision.

European Varieties.

Anderson.

Bur medium to small, spines very long, slender; nuts medium, smaller than Ridgely, bright, reddish brown, pubescent at tip, and thinly over one-half, pointed; foliage medium to small, leathery; the original tree is a strong grower and heavy bearer; in 1898 it produced nearly ten bushels of nuts; spreading, open; apparently about sixty years old, standing near the house of Mr. Horace Roberts, Flushing, N. J. Named for a colored man, who once owned the tree, and who used to sell from $30 to $40 worth of nuts annually. Facts from Mr. Horace Roberts.

Bartram.

Bartram Late (Corsa). Bul. Div. of Pomology, 1896, Nut Culture in the U. S.

Burs medium to small, spines medium; tree vigorous, spreading, prolific; foliage large, very healthy; nut medium, 22 m.m. broad, 23 long, 12 thick, thickly pubescent at tip, dark, bright-reddish, mahogany color, three in a bur, said to be unusually free from worms, quality, good. Ripens at Parry, N. J., October 20.

Origin unknown. The original tree was standing on a farm bought, in 1857, by Mr. J. Hibbard Bartram, Milltown, Chester Co., Pa. Mr. Bartram says: "The tree is now nearly dead, caused, I think, from overbearing. It has borne five bushels of nuts in a season, and the nuts are bright, clear, and free from worms." (Correspondence.)

Comfort (Fuller).

Comfort (Fuller). Nut Culturist, p. 100, 1896. Also described by Corsa, in 1896, in "Nut Culture in the U. S." Fuller's description is more complete.

Cooper, locally.

The bur, nut, foliage, habit of tree, and other characters are very similar to Paragon. The peculiar foliage which distinguishes these varieties from other Europeans indicates their identity. The only difference I have been able to see was the greater susceptibility of Comfort to leaf blight in 1897, though the difference was not apparent in 1898. Mr. Walter Corson, Plymouth Meeting, Pa., has suggested that Comfort never has more than three nuts in a bur, while Paragon frequently has more. The Comfort is supposed by Mr. H. W. Comfort, Fallsington, Pa., to have come from a nut imported by Mr. Chas. Roberts, living near Philadelphia. The nut was planted by the late Jeremiah Comfort, Spring Mills, Pa., more than fifty years ago. The original tree is still standing. The variety is in no way superior to Paragon. Ripens at Parry, N. J., Oct. 10-15.

Cooper (Fuller).

Cooper (Fuller). Nut Culturist, p. 100, 1896.

Comfort, locally.

Burs medium to large, spines long; nuts medium to large, but smaller than Paragon, 31 mm. broad, 27 long, 19 thick, generally three in a bur, dark, very glossy brown, thickly pubescent at tip only; foliage susceptible to leaf blight; tree vigorous, spreading, light bearer when young, older trees said to be very productive. Badly attacked by weevil; a strikingly handsome nut on account of its dark, glossy appearance.

Origin unknown, but grown for years near Haddonfield, N. J.

Corson (Fuller).

Corson (Fuller). Nut Culturist, p. 100, 1896.

Burs large, spines long, branched, husk thin; nuts large, a little smaller than Paragon, 32 mm. broad, 28 long, 20 thick, usually three in bur, dark brown, ridged, heavily pubescent at tip, extending thinly over one-half the nut, quality very good; tree vigorous, spreading; very productive; nuts similar to Paragon, but the broader foliage, more abrupt point, and finer serrations establish independent identity.

Originated in the nursery of the late Allen Corson, Plymouth Meeting, Pa., many years ago. Mr. W. H. Corson, of the same place, who is growing the Corson, tells me that the origin of the variety, further than the note given, is uncertain.

Dager (Taylor).

Dager (Taylor). Rept. Dept. Agric. 1893, p. 295.

Burs medium, densely spined; nuts, medium to large, 32 m.m. broad, 26 long, 25 thick, dark brown, thickly pubescent, quality good, but not quite equal to Ridgely, generally three in a bur; tree vigorous, spreading, productive.

Seedling of Ridgely. Nut planted in 1866, with others, by Mr. H. M. Dager, Camden, Del., and the original tree still stands on Mr. Dager's farm. The Dager is a valuable chestnut, and the largest seedling of Ridgely grown by Mr. Dager.

Darlington.

(See reference Rural New Yorker, LV, 770, E. T. Ingram. No name given.)

Burs medium to small, flattened, spines medium, husk medium thin; nuts medium to large, generally three in a bur, dark, distinctly striped, fuzz thick and confined to tip, quality sweet, good, 34 m.m. broad, 29 long, 20 thick; tree vigorous, between spreading and spire form; ripens at West Chester, Pa., from October 1 to 10. The Darlington is one of the earliest European varieties, and is particularly valuable on that account. It should be more widely propagated. Seedling raised by the du Ponts. About 1850 a few grafts were taken from Mr. du Pont's trees and set on native trees on the farms of Mr. Thomas Darlington and Mr. Ingram, West Chester, Pa. Many of these chestnuts have been propagated in the vicinity of West Chester, and I have called it Darlington on the suggestion of Mr. Edward T. Ingram, West Chester, Pa., in honor of the late Thomas Darlington, who was instrumental in disseminating the variety.

du Pont.

The name *du Pont* has been given to a number of chestnuts that originally came from the du Pont trees, but as the name stands for no one variety in particular it has been discarded in order to clear up the nomenclature of the varieties.

iller.

Miller's du Pont (Fuller). Nut Culturist, p. 102, 1896.

Bur medium, spines long, but slender; nut medium, thickly pubescent at tip, quality fair, about the size of Ridgely; foliage excellent. Grown in Delaware county, Pa., but origin unknown. I have called it Miller to simplify its nomenclature.

Ripens at Parry, N. J., Oct. 10-15.

oncur (Packard).

Moncur (Packard). Rural New Yorker, LIV, p. 23.

Bur medium, spines medium, stiff; nuts a trifle smaller than Ridgely, very meaty, apex round, 29.5 m.m. broad, 29 long, 25 thick, lighter in color, striped, heavily pubescent, excellent quality; tree vigorous, spreading, very prolific.

Seedling of Ridgely. Nut planted about 1855 by Mr. James H. Todd, Dover, Del., on his father's farm. The original tree stands on the farm now owned by Mr. Frank Moncur, near Dover, Del. The top is 60 feet in diameter. Ripens with Ridgley.

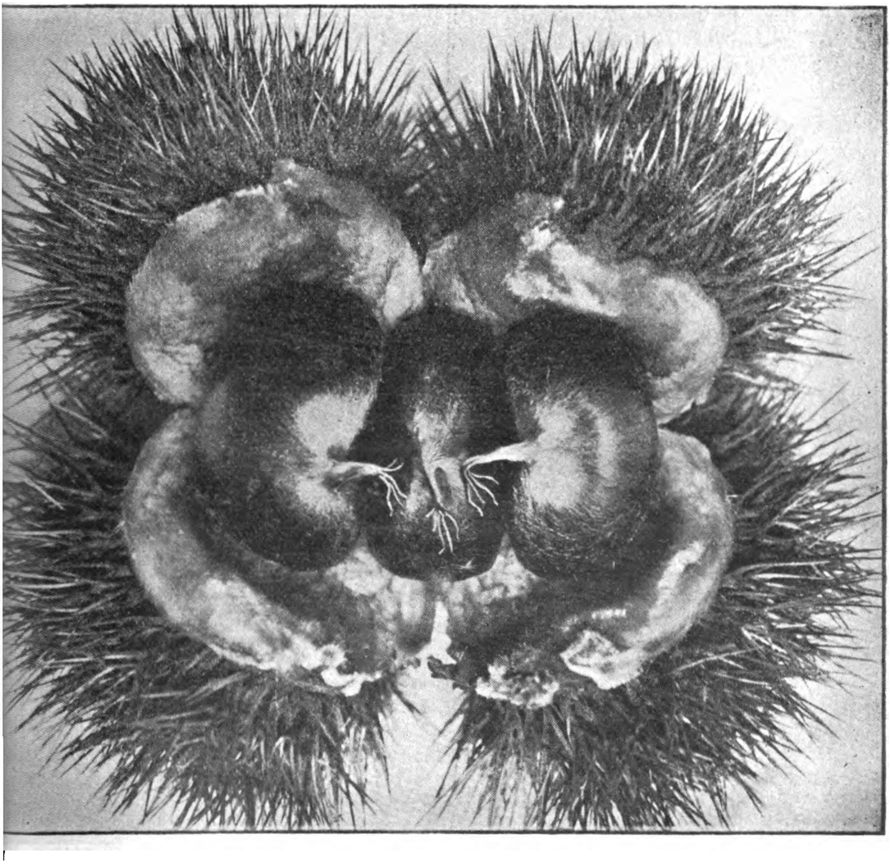


FIGURE 8. *Paragon. (Natural size). Page 26. Note immense size of* ***bur.***

Numbo (S. C. Moon). Fig. 5.

Numbo (S. C. Moon). Descrip. Cat., not dated, 1882 or 1883.

Burs medium, *distinctly conical*, spines slender, medium length; nut large, 1 to 3 in a bur, pointed, tip very long, 32 m.m. broad, 30 long, 23 thick, dark, bright brown, striped, handsome, thinly pubescent, quality excellent; tree close headed, but spreading, even drooping; foliage good; light bearer with many; often covered with second crop of burs in September in nursery rows. Ripens at Parry, N. J., Oct. 5-10.

One of a number of seedlings from imported nuts. Originated about 1850, with the late Mahlon Moon, Morrisville, Pa. The name is a contraction of *Magnum Bonum*. In its early history it was classed with both the American and Japanese types.

Paragon (Popular Gardening). Fig. 9.

Paragon (Popular Gardening). Dec. 1888, p. 52, editorial.

Great American (Pa. State Hort. Assoc. Proc. 1887, p. 61).

Burs immense, flattened, spines very long, branched, husk fleshy; nuts large, three or more in a bur, apex broad, depressed, 34 m.m. broad, 30 long, 23 thick, pubescent at tip, and slightly over two-thirds, dull, dark brown, ridged, quality excellent; tree hardy, spreading, vigorous; foliage *distinct, narrow, coarsely serrate, tapering gradually at the point*, base narrow, subject to leaf blight; enormously productive. Ripens at Parry, N. J., Oct. 10-15.

Probably a seedling of a European Chestnut, popularly supposed to have been planted by George Washington, standing at the first of this century on the west bank of the Schuylkill, above Philadelphia, on land owned by Richard Peters. The parent nut was obtained by the late W. L. Shaffer, Germantown, Pa., and was planted there more than fifty years ago, (exact date unknown), on land now occupied by the Deaf and Dumb Asylum. About 1875 the late H. M. Engle, Marietta. Pa, obtained grafts through Mr. Thomas Meehan, and introduced the nut in the early eighties, first as *Great American*, from its supposed American origin, and later as *Paragon*, when its European descent was fully accepted. Its early prestige was a result of its supposed American origin, it being referred to the American type in its early references. Bailey, in 1891, (Am. Garden, XII, 276), classed it as an American from the tapering form, and broad, deep serrations of the leaf, which are similar in the American foliage.

The form of the leaves alone support the supposed American origin of the Paragon, but the thickness of the foliage, which I have found a much less variable character than form, is distinctly European; the narrow base of the leaf is more European than American; and the low, spreading tree is distinctly European. It is not unlikely that the parent nut resulted from American pollen on the European pistil, for the Americans and Europeans readily cross; or, what is equally probable, the form of the foliage may be a varietal variation from the type. I am personally inclined to the latter view, as I find many gradations in form in the foliage of the European type, the same tree, as the Ridgely, or Styer, often producing leaves which vary from the abrupt to the narrow, long, tapering point.

I am indebted to Mr. Thomas Meehan for the facts concerning the parentage and early history of the Paragon.

Ridgely (Van Deman). Fig. 4.

Du Pont (Van Deman). Rept. Dept. Agric., 1889, p. 440.

Ridgely (Van Deman). Rept. Dept. Agric., 1890, p. 46.

Spanish, locally.

Bur medium to large, densely covered with medium length spines; nut medium to large, a little smaller than Paragon, 33 m.m. broad, 27 long, 25 thick, less pubescent, darker color, quality excellent; foliage narrow, most healthy of any European I have seen, very free from blight, tree vigorous, spreading, very productive, hardy; wood light colored; one of the most valuable. The progenitor of a large number of unnamed seedlings in the vicinity of Dover, Del., few of which, however, equal the parent. Ripens with Paragon. The history of the Ridgely, given me by Mr. Henry Ridgely, Dover, Del., is as follows:

The original tree was sent to the late Henry M. Ridgely by Irénée du Pont, Wilmington, Del., between 1820 and 1825. The tree had been started in a flower pot, and it was set in the garden on Mr. Ridgely's farm, two miles from Dover. The tree bore heavy, annual crops of beautiful nuts until thirty years ago, when it was injured by a storm, since when it has not done so well.

During its early life the variety was called "Spanish," but later it was called Ridgely, by which name it has long been known in Delaware. In 1889 it was mentioned in the report of the Secretary of Agriculture under the name Dupont, and was there called a native variety. In the report of 1890, it was classed as a European under the name Ridgely, the writer, Mr. H. E. Van Deman, saying that it should have been called Ridgely in the report for 1889, and that Dupont was a synonym.

Scott (Fuller).

Scott (Fuller). Nut Culturist, p. 107, 1896.

Bur medium, about like Ridgely, spines very long, slender; nut medium size, 28.5 m.m. broad, 28 long, 17 thick, slightly pointed, generally three in a bur, glossy, dark brown, lightly pubescent, mainly at tip. The original tree an enormous bearer; nuts run down in size when overloaded. I cannot give the habit of the young trees, but the parent is said to be open and spreading. Ripens at Parry, N. J., Oct. 18-25.

I am informed by Mr. John Parry that the original tree was purchased by the father of Judge Scott, formerly of Burlington, N. J., many years ago, with several others, from the nursery of Mr. Thos. Hancock. The tree producing the Scott was noted for its enormous productiveness, and the freedom of the nuts from weevil, the nuts from trees on either side frequently being severely injured. The original tree is standing near Burlington, N. J., on a farm owned by Judge Scott.

Spanish.

Marron.

Mammoth Sweet Spanish.

French Marron, and the like.

A general name for European chestnuts, with no varietal significance.

"Marron" is the French name for the cultivated chestnuts.

Styer (Fuller).

Styer (Fuller). Nut Culturist, p. 108, 1896. The credit for the name is given Fuller, as his description is much more complete.

Hannum (Corsa). Bul. Div. of Pomology, 1896, "Nut Culture in the U. S.," p. 86.

Concord, locally.

Burs medium, roundish, spines medium length, slender; nut medium, pointed, pubescent at point, bright, dark brown, striped, one to three in a bur. "The original tree, which is mammoth in size, is still standing on a farm of a Mr. Hannum, near Concordville, Delaware County, Pa." (Fuller.) Ripens with Paragon.

The Styer is the most vigorous of any of the Europeans in the nursery. The foliage is very large, and free from disease, bright, dark green ; leaves frequently twelve inches long, and the trees are characterized by a straight, upright habit.

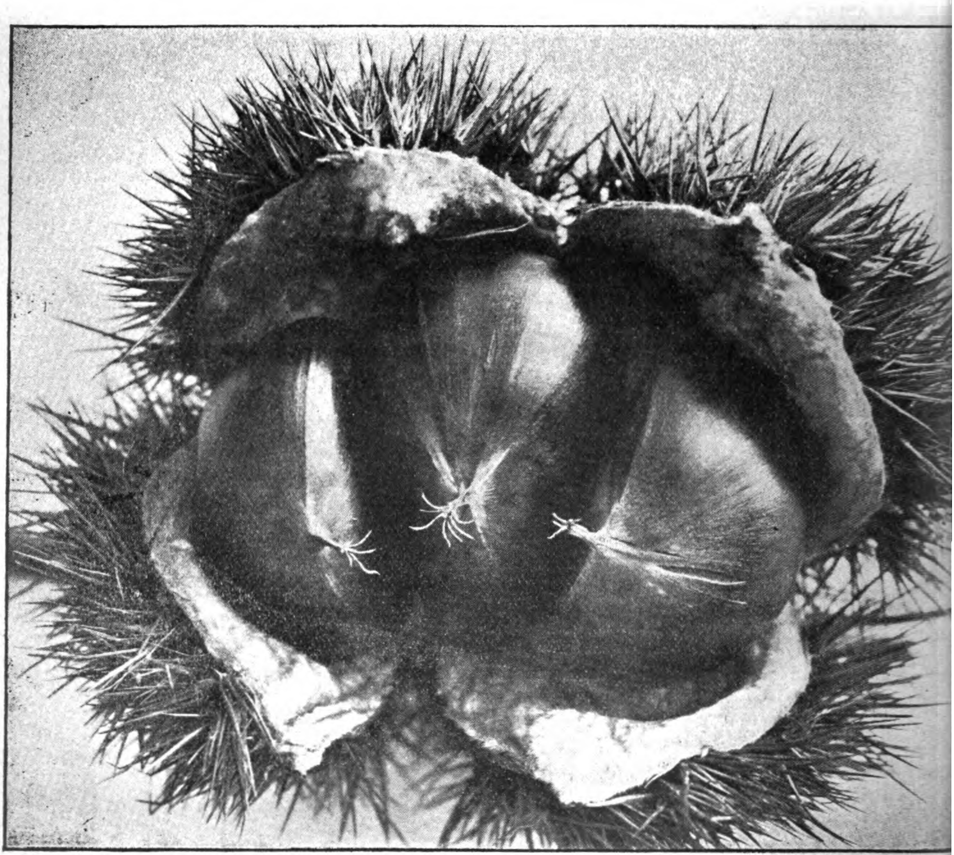


FIGURE 9. *Parry.* (*Natural size*). *Page 32. Note the small size of bur. Compare Figure 8.*

Japanese Varieties.

Advance (Parry Bros.).

Advancc (Parry Bros.). Cat. Fall, 1890.

" Bur, medium, slightly flattened on top ; spines, medium, short, almost sessile, branching, and widely separated on a very thin husk ; nuts very large ; shell, a light, yellowish brown, with a few slight, darker streaks from base to apex. Quality, excellent for one of this species. Ripens early." (Fuller, in Nut Culturist, p. 111.) Ripens just after Alpha. Seedling of Parry. Originated with Parry Bros. Not catalogued at present by the originators. In no way superior to Alpha.

Alpha (Parry Bros.).

Alpha (Parry Bros.). Cat. Fall, 1892.

Burs medium to small, somewhat flattened, spines thick, short, stiff, husk thin; nuts medium to large, generally three in a bur, apex broad, point short, 34 m.m. broad, 28 long, 22 thick, dark colored, ridged, quality fair; tree very upright, and one of the most vigorous, prolific; ripened at Parry, N. J., in 1898, Sept. 8-20th. One of the most valuable on account of its early ripening. Sold in 1898 at $12 per bushel. Ripened in 1898 with Prolific, in 1897 one week ahead. Seedling of Parry. Originated with Parry Bros.

Beta (Parry Bros.).

Beta (Parry Bros.) Cat. Spring, 1896.

Bur small, spines rather long and thin, few, husk thin; nut medium; shell light brown, smooth, with a slight trace of pubescence near the tip. "The leaves are shallow and coarsely serrate, and on some the teeth or serrations are entirely wanting." Fuller, in Nut Culturist, p. 111. Ripens just after Alpha. Seedling of Parry. Originathed with Parry Bros.

Biddle (Kerr).

Biddle (Kerr). Ann. Price List, Fall, 1893.

Bur medium size, spines long and abundant; nuts large, broader than long, 36 m.m. broad, 32 long, 23 thick, light pubescence covering nearly a third of the nut, bright brown, two to five in a bur, quality fair; tree regular, close, round headed, vigorous; bark, light; opens at Denton, Md., Sept. 25 to Oct. 1. The Biddle has more pubescence than any Japanese nut I have seen. Seedling from seed imported by J. T. Lovett. Bought in 1885 by J. W. Kerr, with others, as Japan Giant.

Black (Heiges). Fig. 12.

Dr. Black (Kerr). Ann. Price List, Fall, 1893.

Black (Heiges). Rept. of Pomologist for 1894, p. 16, 1895.

Bur large, spines medium, abundant; nuts large, three to seven in a bur, dark brown, slight pubescence at tip, 31 m.m. broad, 28 long, 21 thick; tree round, close headed, prolific, vigorous; opens Denton, Md., Sept. 8 to 15. Seedling from nuts imported by J. T. Lovett. Bought in 1885, with others, by J. W. Kerr as Japan Giant. Named for Dr. J. J. Black, New Castle, Del.

Valuable on account of earliness, but somewhat objectionable on accout of the large number of nuts in a bur, which makes many of them ill-shaped.

Coe (Hale).

Coe (Hale). Cat. 1898.

Burbank (Hale). Rural New Yorker, LIV, 742, mentioned as the Burbank chestnut.

Mammoth Sweet Japan, l. c.

I have not seen this variety, but it is said by Luther Burbank to be "very large, very sweet (as sweet and tender as the best eastern chestnuts)." (Correspondence). J. H. Hale says the tree is upright, with a somewhat spreading habit. (Cat. 1898). Originated from seed imported in 1886 by Luther Burbank. Sold to the late Judge Andrew J. Coe, Meridan, Conn. Now propagated by J. H. Hale.

Eureka (Parry Bros.).

Eureka (Parry Bros.). Cat. Fall, 1887.

"Very large, very productive, and good quality."

The Eureka was catalogued by Parry Bros. for a few years with the description quoted above. It is no longer catalogued, but trees are still growing in the Parry Bros. nurseries. Seedling imported from Japan by J. T. Lovett, and introduced by Parry Bros.

Felton (Taylor).

Felton (Taylor). Rept. Dept. Agric, 1893, p. 295.

Bur small, spines thinly scattered over a thick husk; nut medium, smaller than Alpha, slightly pointed, dark brown, ridged, slight pubescence at tip, quality excellent for a Jap; tree close, round headed, fairly prolific; tree holds dead foliage part of winter; opens at Felton, Del., Sept 20-30. Seedling from trees imported by J. T. Lovett. Bought in 1889 by J. W. Killen, Felton, Del.

Giant. (Various catalogues.)

Japan Giant. *Mammoth.*
Giant Japan. *Japan Mammoth.*
Giant. *Pedigree Mammoth*, and similar names.

The names *Giant* and *Mammoth* of the catalogues represent seedling chestnuts from large nuts. The names in most cases have no varietal significance, and should be changed where a distinct variety is indicated.

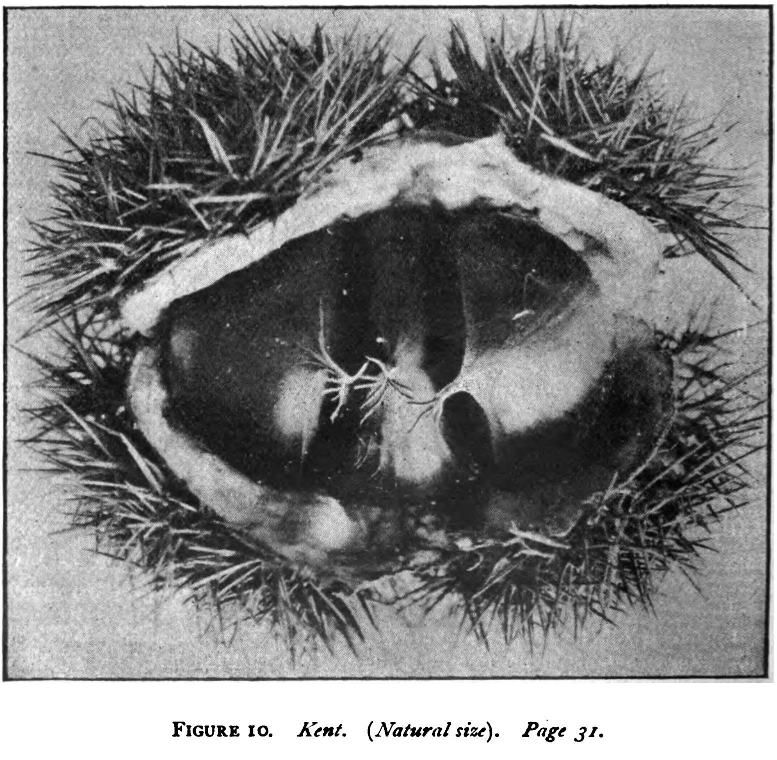


FIGURE 10. *Kent.* (*Natural size*). *Page 31.*

Hale (Hale).

Hale (Hale). Cat. 1898.

Eighteen-Months (Hale). Rural New Yorker, LIV, 742, mentioned. Fig. l. c. 773.

I have not seen the Hale, but of it J. H. Hale says:

"The burs have a very thin, papery shell; the spines are short and not thickly set on the outside; each always contains three fine, large, plump nuts, of a rich brown color." Also, "The tree is of low, spreading habit, with numerous slender, short-jointed twigs, with narrow, long-pointed leaves of a very dark, glossy green." (J. H. Hale, Cat. 1898.) Mr. Burbank says the Hale was call "Eighteen-Months" because the tree bore one bur of very choice, large nuts, eighteen months from dropping the seed; also, that the variety usually bears the first season from grafts, and bears heavily every season. (Correspondence.) Originated from seed imported in 1886 by Luther Burbank. Sold to the late Judge Andrew J. Coe, Meriden, Conn. Now propagated by J. H. Hale.

Kent. Fig. 10.

Extra Early (Killen). Rural New Yorker, LVI, 239. Fig. l. c. 786.

Burs small, spines thick, stiff, rather long, husk paper like; nuts medium to large, generally three in a bur, flattened, apex pointed, point long, scar prominent, 34 m.m. broad, 33 long, 20 thick, dark mahogany, ridged, quality fair; nuts fall with burs; tree close round-headed, prolific early bearer; opens at Felton, Del., Sept. 1 to 15. One of the most valuable on account of its early ripening, dark color, and prolific bearing. Seeding from trees imported by J. T. Lovett. Bought in 1889 by J. W. Killen, Felton, Del.

Kerr (Kerr).

Kerr (Kerr). Ann. Price List, Fall, 1893.

Bur small, roundish spines, short, and very thinly distributed on the paper like husk; nuts medium to large, very dark mahogany, slightly broader than long, 33 m.m. broad, 31 long, 22 thick, three in a bur, not cast freely, quality excellent; tree regular, close, round-headed, very prolific; bark somewhat dark colored; opens at Denton, Md., Sept. 10 to 20. Seedling from seed imported by J. T. Lovett. Bought in 1885 by J. W. Kerr, with others, as Japan Giant. Named for J. W. Kerr, Denton, Md. The earliness, prolific bearing tendencies, beautiful dark nuts, and vigor of the tree make the Kerr one of the most desirable varieties.

Killen (Heiges).

Killen (Heiges). Rept. of Pomologist for 1894, p. 29, 1895. Also published in 1895 by Van Deman, Proc. Am. Pom. Soc., p. 79, but originally named by Heiges. (See Proc. Peninsula Hort. Soc., 1897, p. 106).

Burs very large, flattened, spines very long, low branching, very stiff, husk thick, thickly covered with spines; nuts very large, broader than long, apex somewhat pointed, point short, light brown, ridged, quality excellent; tree upright, open and more spreading than is usual in the species, not so vigorous as some, productive; opens at Felton, Sept. 20 to Oct. 1. The Killen is the largest cultivated chestnut I have seen. The original tree died from sun scald in 1898, but the variety is preserved in several small grafted trees.

Seedling from trees imported by J. T. Lovett. Bought in 1898 by J. W. Killen, Felton, Del. Named for J. W. Killen, Felton, Del., by former U. S. Pomologist Prof. S. B. Heiges.

Mammoth. (Various Catalogues).

See *Giant.*

Martin.

Colonel Martin (Kerr). Ann. Price List, Fall, 1893.

Burs large and flattened, spines abundant, long, husk medium thick; nuts nearly as large as Parry, broader than long, apex, roundish, point long, light pubescence at tip, bright mahogany red, scar large, three to five in a bur, 42 m.m. broad, 35 long, 25 thick, quality rather poor, but good when cooked; tree a very vigorous grower, open, spreading; foliage large; bark light; prolific. A beautiful nut. Opens at Denton, Md., Sept. 20-25.

Seedling from nuts improved by J. T. Lovett. Bought in 1885, with others, by J. W. Kerr, as Japan Giant. Named for the late Colonel Martin, Seaford, Del.

McFarland.

"*Early*" (Hale). Rural New Yorker, LIV, 742. Fig. l. c. 773.

Coe's Early (Hale). Catalogue, 1898.

I have not seen the variety, but of it the originator, Luther Burbank, says: "Exceedingly early, fully three weeks before other chestnuts. Has large size, extra fine quality. Bears very heavy every season. Burs, immense. Ripens here Sept. 1 to 20. Is of spreading habit, with large leaves." (Correspondence.)

Originated from seed imported by Luther Burbank in 1886. Sold to the late Judge Andrew J. Coe, Meriden, Conn. Now propagated by J. H. Hale as McFarland.

Parry. Fig 9.

Japan Giant. "*Home Grafted*" (Parry Bros.). Cat., Fall, 1889.

Japan Giant. "*Parry's*" (Parry Bros.), Cat., Spring, 1891.

Giant (Corsa). Nut Culture in U. S., Div. of Pomology, 1896.

Giant Japan (*Parry*) (Fuller). Nut Culturist, 1896.

Parry's Giant (Parry Bros.) Cat., Fall, 1897.

Burs very large, spines thick, long, low branching, stiff, husk thin; nuts very large, one to three in a bur, oblate, apex broad, sometimes depressed, point small, 44 m.m. broad, 37 long, 25 thick, bright, dark mahogany, ridged, quality good; prolific, early bearer, open, spreading; foliage large for the species. The progenitor of more valuable seedlings than any other Japanese chestnut in the United States. Ripens at Parry, N. J., Sept. 20 to Oct. 1.

The finest of 1000 grafted Japanese chestnuts. Imported in 1882 by the late William Parry, under the name "Japan Giant." The grafted trees were not of the same parentage, as the nuts of no two were alike. I have called the variety *Parry* to simplify its nomenclature, as *Giant* or *Japan* are seedling names. It was first called *Japan Giant* "*Parry*" to distinguish it from Japanese seedlings sold as "Giant." Its immense size, prolific bearing tendencies, and the beautiful, bright, mahogany nuts make it a very valuable chestnut.

Prolific.

Early Prolific (Parry Bros.). Cat. Fall, 1887.

Burs small; spines long and abundant; nut medium, longer than broad, apex pointed, distinctly striped, three in a bur, tree close headed; foliage very small and peach like, teeth very fine; prolific and vigorous; opens at Parry, N. J., Sept. 10 to 20. In 1897 it opened one week later than Alpha. In 1898 they ripened together. In 1897 the nuts were more pointed than in 1898.

Seedling imported from Japan by J. T. Lovett. Introduced by Parry Bros.

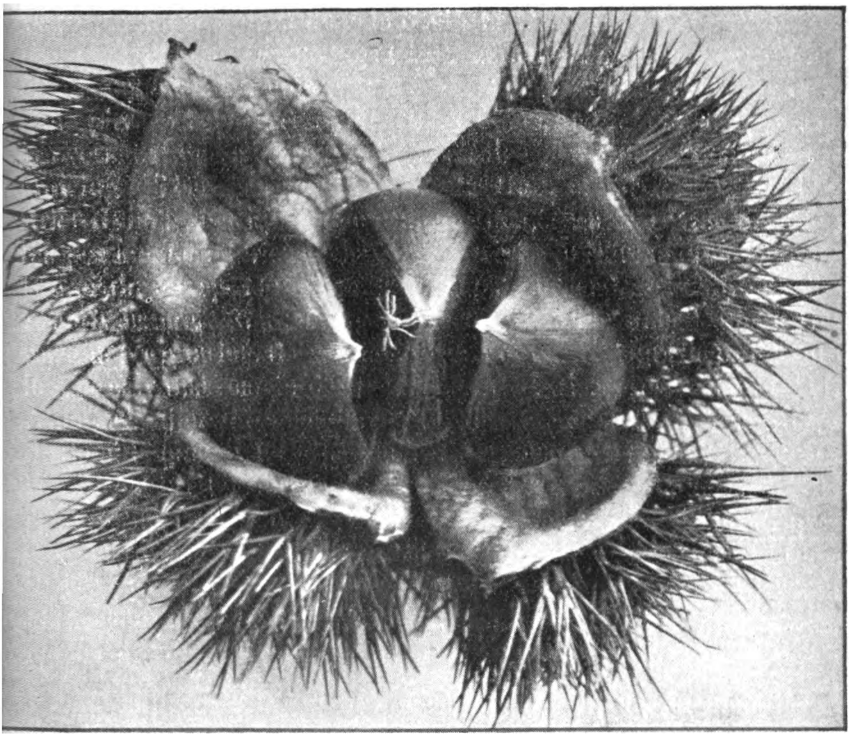


FIGURE 11. *Reliance*. (*Natural size*). *Page 33*.

Reliance. Fig. 11.

Early Reliance (Parry Bros.). Cat. Fall, 1890.

Burs medium; spines short, deflexed, thick; very thin husk; nuts medium to large, pointed, generally three in a bur, longer than broad, ridged, light brown, 31 m.m. broad, 32 long, 22 thick, quality fair; enormously productive; cions frequently bear the same season as set; tree dwarfish, spreading and drooping; ripens at Parry, N. J., Sept. 25 to Oct. 1. Ripened one week before Parry in 1896, with it in 1897-8. The most precocious bearing chestnut I have seen. The burs should be picked from the trees for two or three years after setting, and thereafter thinned. Runs down in size if allowed to overbear. One of the most valuable. Seedling of Parry at Parry Bros.

Success (Parry Bros.).

Success (Parry Bros.). Cat., Fall, 1890.

"Burs, very large, broad, with only a few short scattering, branching spines on the top, thicker toward the base; on a thin, parchment-like husk, and this is so thin that it sometimes cracks open and exposes the nuts within before they are fully ripe. Nuts, extra large, nearly equal to Giant, (Parry, G. H. P.), but of a more regular and symmetrical form, being nearly as long as broad, tapering to a point. Usually three nuts in a bur; an ideal variety in every respect." (Fuller, in Nut Culturist, p. 112.)

Ripens at Parry, N. J., Sept. 20-25. I do not consider it as good as Parry. Seedling of Parry. Originated with Parry Bros.

Superb.

Parry's Superb (Parry Bros.). Cat., Fall, 1892.

"Burs, broad, cushion-shaped, or much flattened on top, with extra long, widely branching spines from single or multiple stems, very much as in the European varieties. Nuts, large, broader than long, with a decided sharp, woody point; almost entirely destitute of even a sign of pubescence. A very promising and distinct variety." (Fuller, in Nut Culturist, p. 112.)

Seedling of Parry, originated with Parry Bros.

Estimate of Varieties. The varieties of the cultivated chestnuts are not well enough established, nor have they been grown on a sufficiently comprehensive scale to determine their horticultural value. Some of the most promising kinds are confined to a few trees only. It is therefore impossible, to compare the various kinds, justly, but the reader would probably not be satisfied unless some expression of preference was recorded. Nothing more than a personal preference can be expressed, and the following varieties include those that the writer would plant on his own place for commercial purposes. The first list is based upon the behavior of the varieties that are growing on an extensive scale, the second list includes those kinds which are promising, but which have not been grown extensively.

Varieties Grown Extensively.

Japanese — Alpha, Reliance, Parry. First Choice.
European—Paragon. First Choice.
Numbo. Second Choice.

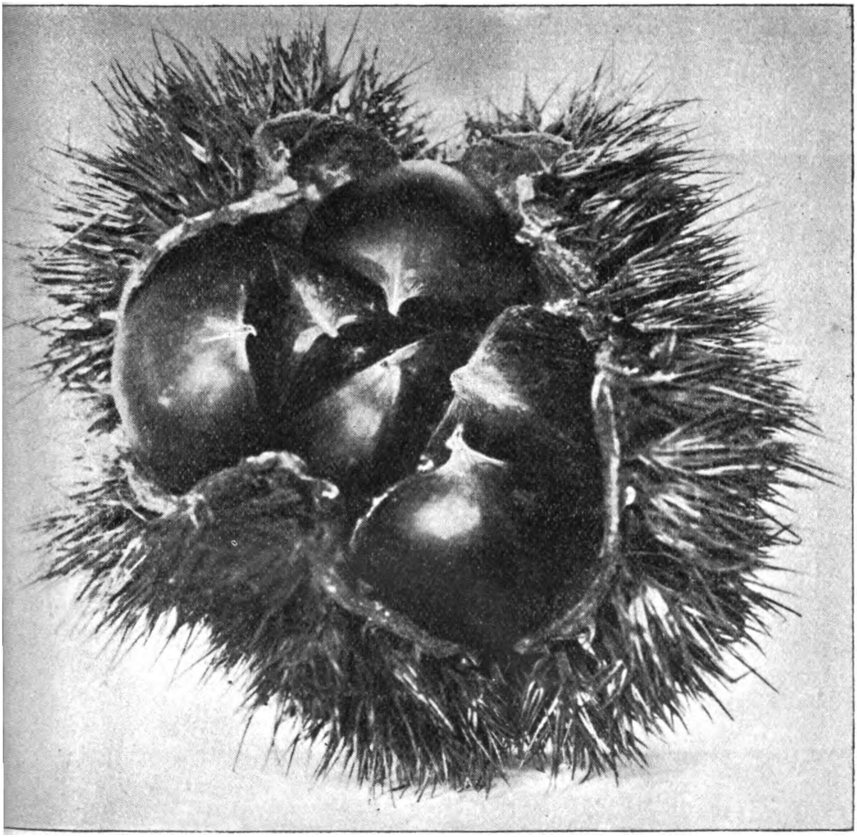
Varieties not in Large Blocks, but Promising.

Japanese — Kerr, Kent, Killen. First Choice.
Biddle, Felton, Martin. Second Choice.
European—Ridgely, Scott, Styer. First Choice.
Dager, Darlington. Second Choice.

The Hale, McFarland, and Coe are highly spoken of, but the writer has never seen specimens and is therefore unable to give them a fair estimate.

G. HAROLD POWELL.

NOTE.—The writer wishes to express his appreciation of the assistance given by the nurserymen, and others, who have sent him facts on the chestnut industry. Especially, however, should much credit be given Mr. John R. Parry, of the Parry Bros'. Nurseries, through whose interest and co-operation, the preparation of this bulletin was made possible.



URE 12. *Black.* (*Natural size*). *Page 29. Note ill-shaped nuts when the bur contains more than three.*

Arno